Chapter 4 – IDENTIFICATION AND SCREENING OF TECHNOLOGIES

4.1 Introduction

This chapter summarizes the development of a list of preliminary screening of technologies and associated process options, and initial qualitative screening of technologies. Section 4.2 presents a list of databases reviewed in developing a list of potentially applicable technologies. Section 4.3 describes the technology screening process. Preliminary screening was performed using engineering judgment to assess the effectiveness of each technology in reducing potential Site risks. Technologies that passed through the preliminary screening were then further qualitatively screened, based on effectiveness, implementability, and cost. Tables 4-1 and 4-2 provide a synopsis of this information. Section 4.4 summarizes representative process options (at least one for each technology) that were selected following qualitative screening for compilation into remedial alternatives as presented in Chapter 6. Appendix A presents a detailed discussion of the general response actions, process options, or technologies, including limitations for cleanup of soils containing certain metals and mixtures of metals.

The screening of technologies and process options in this section focuses on the soil volumes defined in Chapter 3. Additionally, the RAOs summarized in Chapter 2 form the basis for the preliminary screening of technologies and process options.

4.2 Development of Candidate Technologies and Process Options

A list of potentially applicable technologies and process options was developed using the following resources:

- Vendor Information System for Innovative Treatment Technologies (VISITT) database, Version 2.0;
- EPA Risk Reduction Engineering Laboratory (RREL) database;
- EPA Superfund Innovative Technologies Evaluation (SITE) demonstrations;
- Remedial Technologies Screening Matrix and Reference Guide, USEPA and U.S. Air Force, July 1993;
- In-house DuPont Company experience;
- In-house consultant and contractor experience;
- Other consultant reports;
- Treatability studies for other sites; and
- Literature survey.

The technologies are grouped according to "general response actions." These are the broad categories of remedial measures that may be implemented alone or in combination to meet the RAOs. The potentially applicable technologies and process options are presented in the first three columns of Table 4-1. Note that process options are a subset of technologies and describe the different systems, equipment, or chemical processes that were considered as potentially applicable alternatives for remediation of the Site. The fourth column of the table includes a brief description of each process option. This description is included to aid the reader in understanding each process option.

4.3 Technology Screening

Screening of potentially applicable technologies was performed in two steps. First, a preliminary screening was performed to identify technologies that may be applicable to the Site. The preliminary screening was based on a technology's broad-based effectiveness in reducing Site risks. The technologies selected on the basis of preliminary screening then went through a second tier of screening, an initial qualitative screening.

4.3.1 Preliminary Screening

The preliminary screening eliminated technologies or process options, which, for technical reasons, could not be implemented or would not be effective (i.e., technically infeasible), including the following:

- Technologies that have been demonstrated only in a laboratory;
- Technologies that cannot achieve the Cleanup Standards required at the Site; and
- Technologies that are not applicable to the Site for practical reasons.

Table 4-1 summarizes the preliminary screening of technologies and process options. Technologies and process options deemed not applicable are indicated by shading. For example, cryogenic freezing was not a suitable immobilization technology since this process is not a permanent solution. The last column of Table 4-1 presents a brief comment on the applicability of the process option, based on the technology's ability to achieve RAOs. These comments provide explanation as to why a particular process option was retained for further evaluation or rejected.

4.3.2 Technologies That Rely On Stabilization/Solidification

Past interim source/cleanup actions have removed the majority of the known soil locations where lead and arsenic concentrations could potentially be above levels at which characteristic dangerous waste limits could apply. As such, technologies that rely on the mass stabilization of soils to reduce the leachability of lead and arsenic-impacted soils to below the hazardous designation were not retained. Stabilization was retained for further evaluation where the alternative concentrates the contaminants into a smaller volume (i.e. Wet Screening with Stabilization, On-Site Deposition and Cap/Cover).

4.3.3 Initial Qualitative Screening

The process options retained from the preliminary screening were evaluated in the initial qualitative screening. MTCA requires that technologies and processes are screened to determine if the alternatives selected for further evaluation represented those that were permanent to the maximum extent practicable (as defined by WAC 173-340-360 (3)(b)). For this phase of screening the MTCA required criteria were grouped in the following manner:

Effectiveness: Effectiveness contains those criteria that evaluate the state of development of the technology, the ability to protect human health and the environment, and identifies potential negative impacts associated with the technology. Under this heading are the following MTCA criteria:

- Protectiveness: This evaluation considers the degree of protection each technology provides to human health and the environment, the extent to which reductions in risk, toxicity, and/or mobility are expected to be achieved, the time required to reduce risk and obtain cleanup standards, the off-Site and on-Site risks resulting from the implementation of the alternative, and the degree of improvement of the overall environmental quality.
- Permanence: This evaluation considers the degree to which the alternative permanently reduces the toxicity, mobilization or volume of the contaminants. The evaluation considers the materials treated, quantity of material treated, degree of toxicity, mobility, and volume reduction, degree to which the treatment is irreversible, and residuals type and quantity.

- Long Term Effectiveness: This evaluation considers the effectiveness of the process during the time when contaminant concentrations remain on-Site that are greater than CLs or RLs, the magnitude of risk with the alternative in place, and the adequacy and reliability of any Site controls.

- Management of Short Term Risks: This evaluation considers the effectiveness of the process in dealing with the potential impacts to human health and the environment during the implementation phase.

- Consideration of Public Concerns: This evaluation considers any local community concerns over the alternative and how the alternative addresses those concerns.

Implementability: Implementability involves the technical and administrative feasibility of constructing, operating, and maintaining a particular remediation technology. Technical implementability has already been used in the preliminary screening. At this stage, the emphasis is placed on the institutional aspects of implementability, such as the ability to obtain the necessary permits; the availability of treatment, storage, and disposal services; and the availability of necessary equipment and skilled workers to implement the technology.

Cost: The cost for remediation work includes such items as installation and operation of process equipment, excavation, and disposal fees. The cost analysis is made on the basis of engineering judgment, and each process is evaluated as to whether costs are high, medium, or low relative to other process options in the same technology category.

Table 4-2 summarizes the evaluation of the general response actions, technologies, and process options retained after the preliminary screening. In Table 4-2, process options that do not meet the screening criteria and were not considered acceptable based on this initial qualitative screening are indicated by shading. The remaining process options and technologies were retained for further development, assembly, and analysis as remedial alternatives in Chapter 6.

4.4 Representative Processes Selected for the Development of Alternatives

The technologies selected from the two-step screening process include several process options. The "cover" technology, for example, includes eight process options (clean soil cover, re-vegetation, synthetic membrane cap, clay cap, asphalt cap, asphalt/concrete cap, cement cap, and multimedia cap). Many of these process options are similar since they reduce potential exposure. To include all combinations of process options in the development of alternatives would result in the evaluation of hundreds of alternatives with limited benefit.

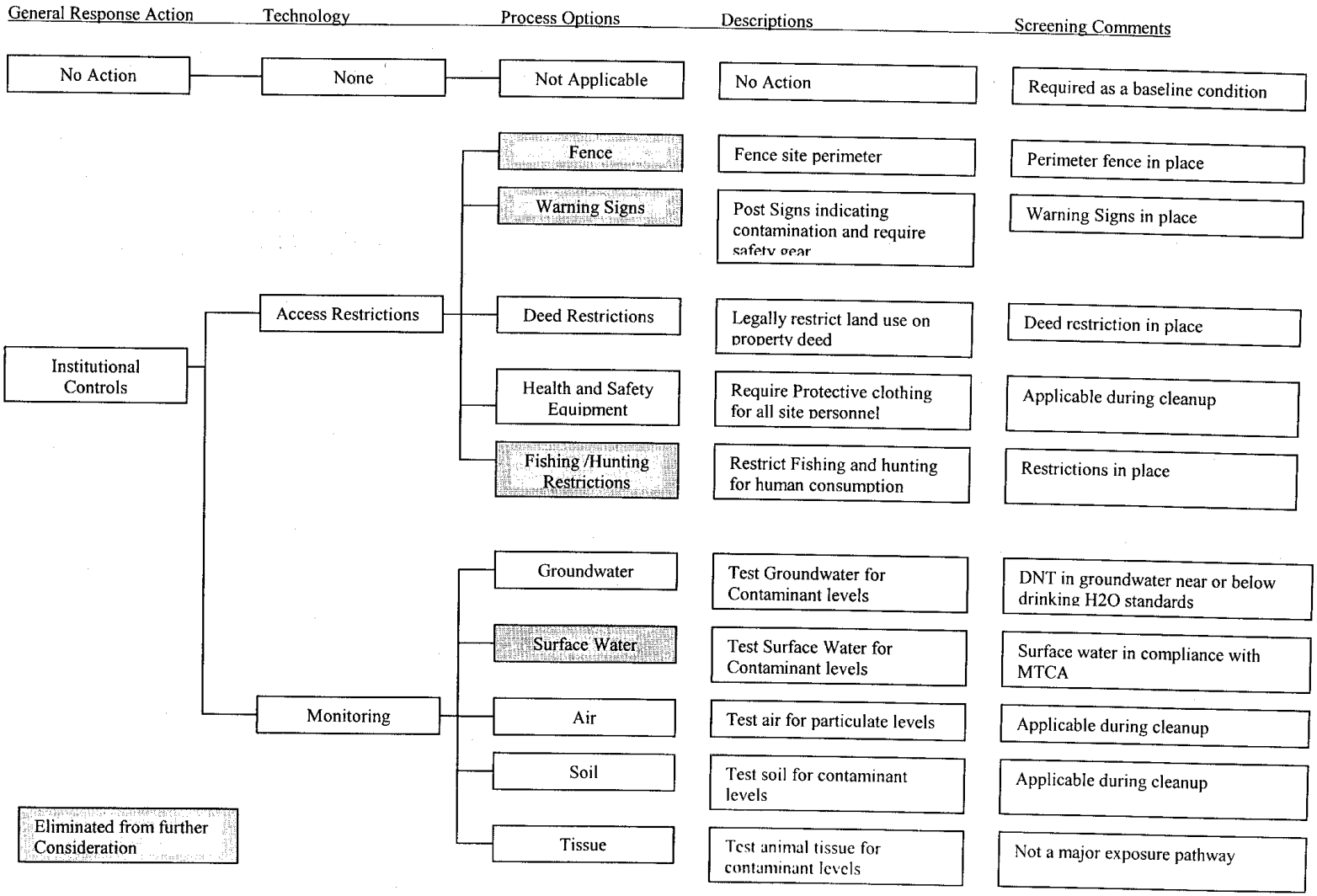
In some cases, the various process options are sufficiently different in their performance that one would not adequately represent the other. In these cases, more than one process option may be selected for a technology type. For example, under the volume reduction technology it was concluded that classification and screening were sufficiently different in performance and cost for both to be included in the remedial alternative development.

The following soil process options were selected as representative:

Technology	**Representative Process Option(s)**
Access Restrictions	• Deed Restrictions
Monitoring	• Soil Sampling
Cover	• Soil Cover
Cap	• Synthetic Membrane • Asphalt/Concrete Cap • Portland Cement Cap • Multimedia Cap
Cap/Cover	• Multimedia Cap • Soil and Gravel Cap
Dust Control	• Water Spraying • Plastic Cover
Immobilization	• None Selected
Excavation	• Conventional Equipment
Off-Site Disposal	• Hazardous Waste Landfill • Demolition Debris Landfill
Recycling	• None Selected
Thermal	• None Selected
Volume Reduction	• Solvent/Chelant Extraction • Acid or Base Extraction • Soil Classification • Sieving and Screening

These technologies and representative process options are discussed in greater detail in Appendix A. The actual process options to be used will be defined in the Cleanup Action Plan. The technologies and representative process options identified in this section are combined into alternatives in Chapter 6 and evaluated in more detail in the remainder of this FS.

Table 4-1: Preliminary Screening of Technologies and Process Options



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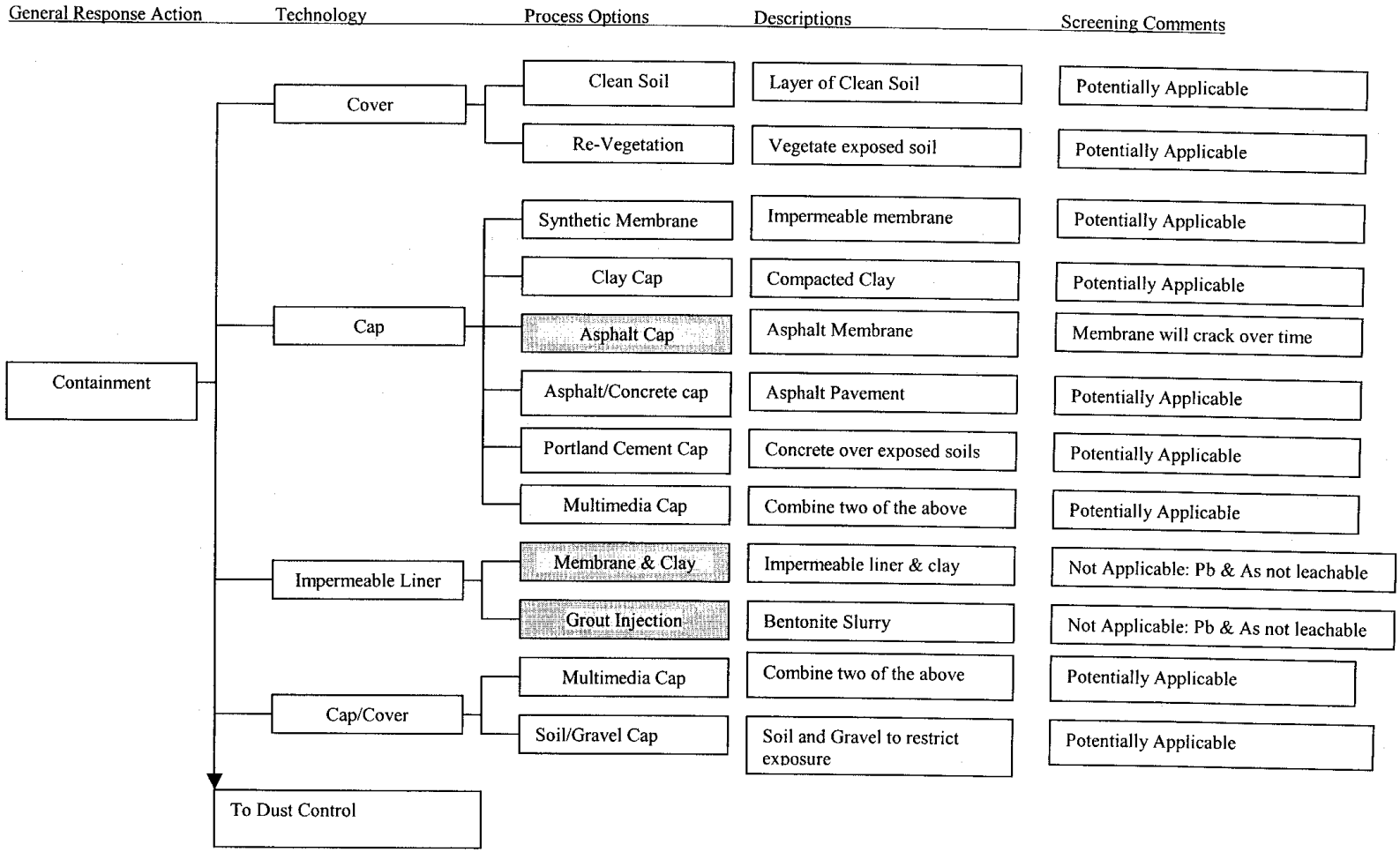

Table 4-1: Preliminary Screening of Technologies and Process Options

General Response Action	Technology	Process Options	Descriptions	Screening Comments
Containment	Dust Control	Water Spraying	Wet Exposed Soils to prevent dust	Potentially Applicable
		Dust Suppressants	Apply chemical binder to exposed Soils to prevent dust	Potentially Applicable
		Wind Fence	Barrier to deflect wind	Irregular wind direction
		Plastic Cover	Plastic cover over exposed soils	Potentially Applicable
		Vegetation	Temporary vegetation cover over exposed soils	Timeframe for growth inhibits production

Eliminated from further Consideration

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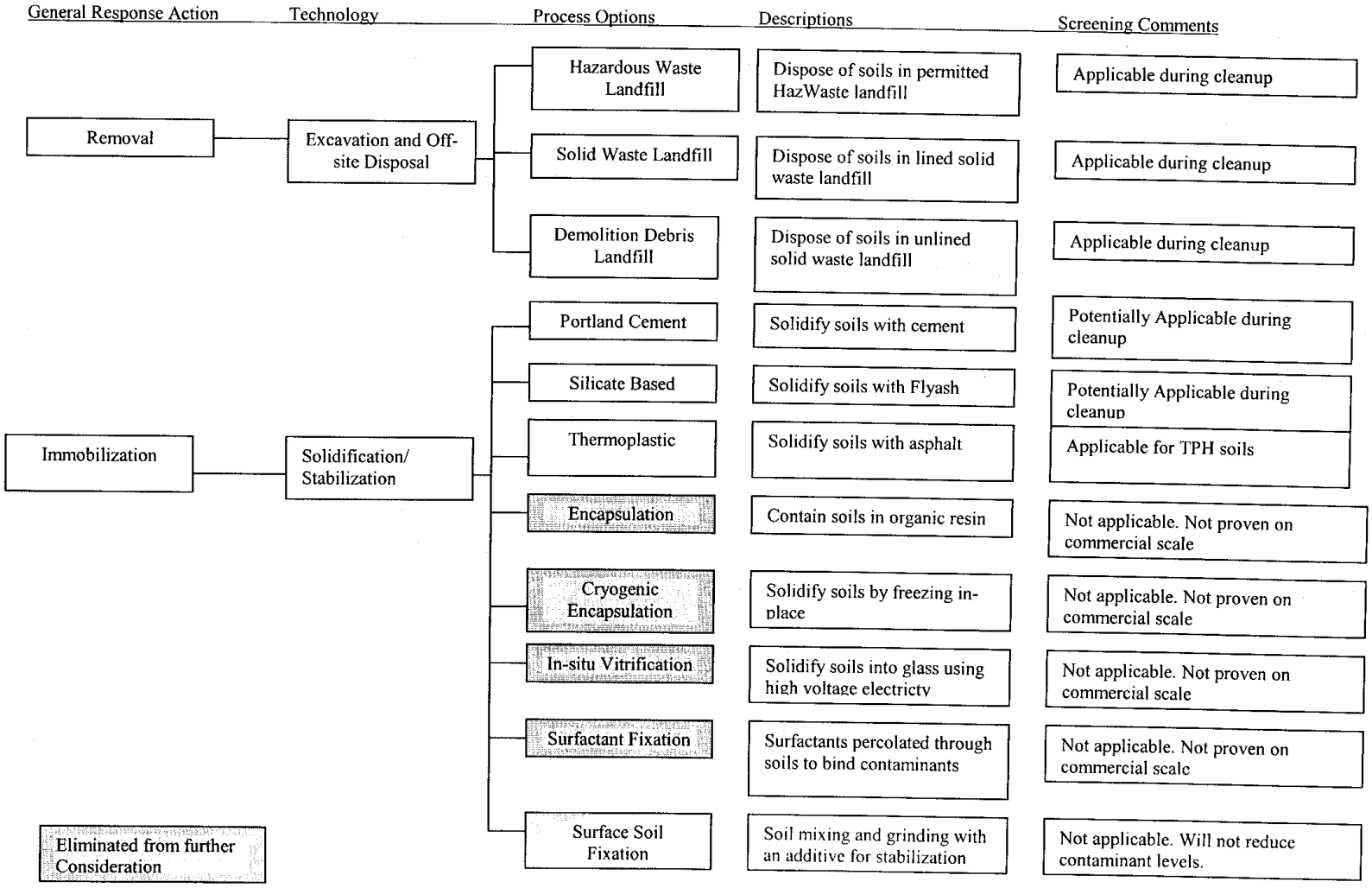

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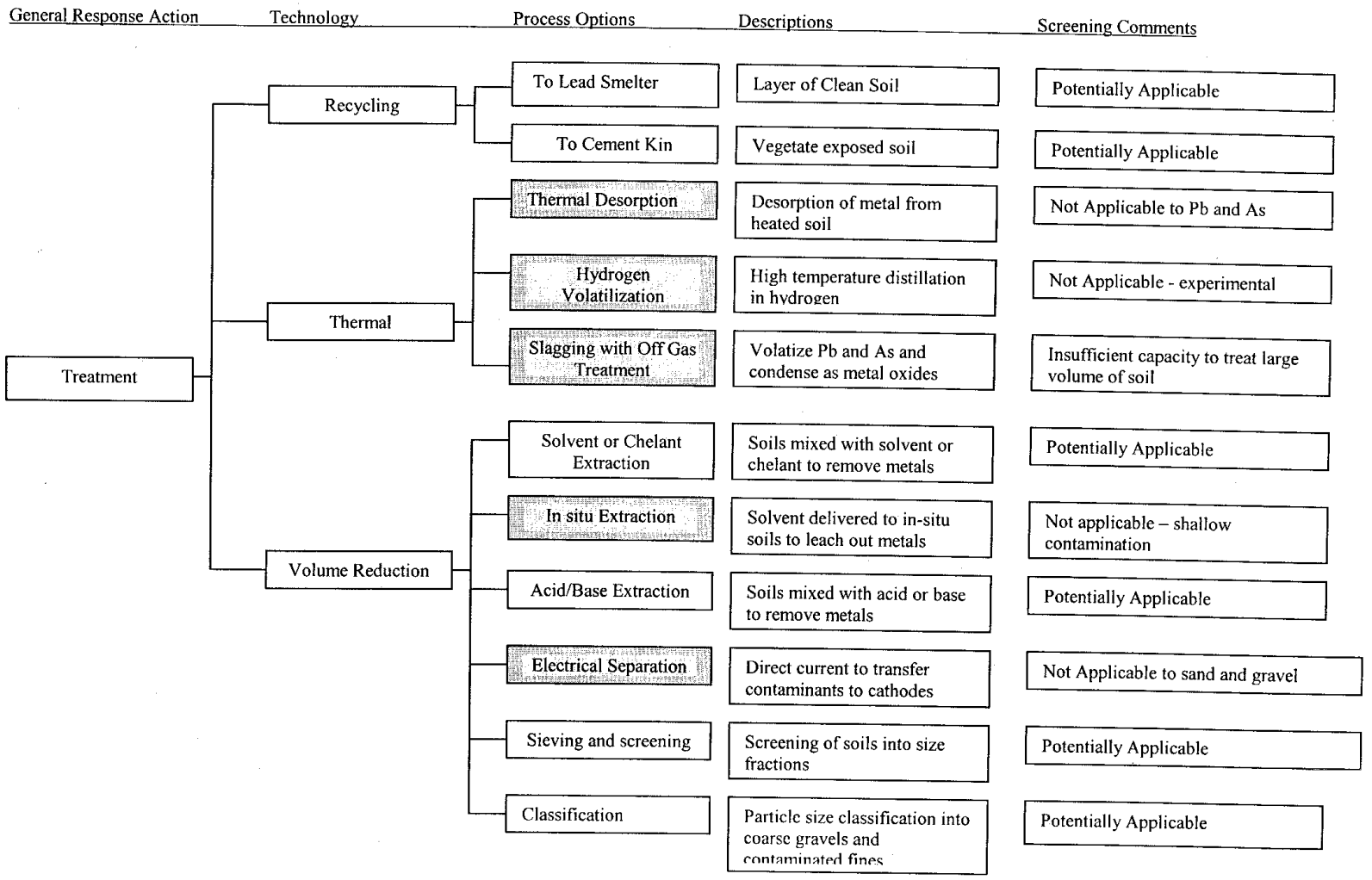

Table 4-2: Evaluation of Process Options

General Response Action	Technology	Process Option	Effectiveness	Implementability	Cost
No Action	None	None	Not Effective, Unacceptable to Companies and Ecology	Easily Implemented	Very low
Institutional Controls	Access Restrictions	Deed Restrictions	Some effect in reducing exposure, does not reduce contamination	Easily Implemented	Low
		Health and Safety	Some effect in reducing exposure, does not reduce contamination	Easily Implemented	Low
	Monitoring	Groundwater	Useful for documenting conditions, does not reduce contamination	Easily Implemented	Low
		Air	Useful for documenting conditions, does not reduce contamination	Easily Implemented	Low
		Soil	Useful for documenting conditions, does not reduce contamination	Easily Implemented	Low
Containment	Cover	Clean Soil	Moderately effective in reducing exposure	Easily Implemented	Low
		Re-vegetation	Marginal effect in reducing exposure	Easily Implemented	Low
	Cap	Synthetic Membrane	Effective in reducing exposure	Easily Implemented	Moderate
		Clay Cap	Tends to crack over time	Clay not readily available	Moderate
		Asphalt/Concrete Cap	Effective in reducing exposure	Easily Implemented	Moderate
		Portland Cement Cap	Effective in reducing exposure	Easily Implemented	Moderate
		Multimedia Cap	Effective in reducing exposure	Easily Implemented	Moderate
	Cap/Cover	Multimedia Cap	Effective in reducing exposure	Easily Implemented	Moderate
		Soil/Gravel Cap	Effective in reducing exposure	Easily Implemented	Moderate
	Dust Control	Water Spraying	Effective in reducing dust during remediation	Conventional construction practice	Low
		Dust Suppressants	Effective in reducing dust during remediation	Conventional construction practice	Moderate
		Plastic Cover	Effective in reducing dust from stockpiles	Conventional construction practice	Low

Eliminated from further consideration

Table 4-2: Evaluation of Process Options

General Response Action	Technology	Process Option	Effectiveness	Implementability	Cost
Removal	Excavation and Off Site Disposal	To Hazardous Waste Landfill	Effective in eliminating contamination on site, does not reduce contamination.	Moderately easy to implement	High
		To Solid Waste Landfill	Not effective for contaminated soils	Easily implemented	Moderate
		To Demolition Debris Landfill	Not effective for contaminated debris Effective for clean debris	Easily implemented	Low
Immobilization	Solidification/Stabilization	Portland Cement	Effective for wide range of chemicals, does not reduce total concentration of contaminates in soils	Easily implemented	Moderate
		Silicate- Based	Effective for wide range of chemicals, does not reduce total concentration of contaminates in soils	Easily implemented	Moderate
		Thermoplastic	Effective for wide range of chemicals, does not reduce total concentration of contaminates in soils	Easily implemented	High
Treatment	Recycling	Recycle to Lead Smelter	Effective for Lead	Difficult to implement due to availability of smelters	High
		Recycle to Cement Kiln	Effective for chemical which pass TCLP	Difficult to implement due to availability of Kilns	Low
	Volume Reduction	Solvent/Chelant Extraction	Effective in reducing volume of contaminated soil	Easily implemented	High
		Acid/Base Extraction	Effective in reducing volume of contaminated soil	Easily implemented	High
		Sieving and Screening	Effective in reducing volume of contaminated soil	Easily implemented	Low to Moderate
		Classification	Effective in reducing volume of contaminated soil	Easily implemented	Moderate

Eliminated from further consideration